B-01

Bailey *Ecoregions of the Continents*

Boundaries

Province

Domain

Division

DATA-SET DESCRIPTION

Data-Set Name: Bailey Ecoregions of the Continents

Principal Investigator(s):

Dr. Robert G. Bailey
USDA Forest Service
Ft. Collins, CO 80524 USA

Scientific Reference:

Bailey, R.G. 1989. Explanatory supplement to Ecoregions Map of the Continents. *Environmental Conservation*, vol. 16, no. 4, pp 307-309.

Bailey, R.G., 1986. A world ecoregions map for resource reporting. *Environmental Conservation*, Vol. 13, No. 3, pp. 195-202.

SOURCE

Source Data Citation:

Bailey, R.G. 1989/1993. Bailey Ecoregions Map of the Continents. Digital vector data on a Geographic (lat/long) global polygon network in Arc/Info format. Cambridge, U.K.: World Conservation Monitoring Center. 623 KB in 1 compressed file on floppy disk.

Contributor(s):

Dr. Mark Collins
World Conservation Monitoring Center
Cambridge, U.K.

Distributor(s):

World Conservation Monitoring Center
Cambridge, U.K.
Tel: 44 223 277314

Vintage:

1989

Lineage:

(1) Original paper map in an undocumented Russian projection:
Dr. Robert G. Bailey
USDA Forest Service
3825 east Mulberry St.
Ft. Collins, CO 80524, USA

(2) Digitized by:
Robert Waltermire
National Ecology Research Center

4512 McMurry Ave.
Ft. Collins, CO 80525-3400

(3) Resampled to Geographic (lat/long) projection by:
Richard Luxmoore
World Conservation Monitoring Center
Cambridge, U.K.

ORIGINAL DESIGN

Variables:

Bailey's Ecoregions, classed by Domain, Division, and Province.

Origin:

Multiple paper map sources integrated and modified by Robert Bailey.

Geographic Reference:

Undocumented Russian projection based on Gerasimov, I.P. (Ed.) 1964. Types of natural landscapes of the Earth's land areas. Plate 75, In Fiziko-geograficheskii Atlas Mira [Physico-geographic Atlas of the World]. USSR Acad. Sci. and Main Administration of Geodesy and Cartography. Moscow, USSR, scale = 1:80,000,000.

Geographic Coverage:

Global

Geographic Sampling:

Vector boundary data from original 1:80,000,000 scale, represented at 1:30,000,000.

Time Period:

Composite of most recent information ca 1960-1980.

Temporal Sampling:

Composite of most recent information ca 1960-1980.

INTEGRATED DATA-SET

Data-Set Citation:

Bailey, R.G. 1989/1994. Bailey Ecoregions of the Continents from the World Conservation Monitoring Center. Digital vector data on a .3 minute resoluton Geographic (lat/long) global polygon network and derived raster data on a 10-minute Geographic (lat/long) 2160x1080 grid. In: Gloal Ecosystems Database Version 1.0: Disc B. Boulder, CO: NOAA National Geophysical Data Center. 1 independent spatial layer with 3 attributes on CD-ROM. 800KB in 9 files.

Analyst(s):

John J. Kineman

Global Ecosystems Database Project
National Geophysical Data Center
3100 Marine St. (Mail Code E/GC1, 325 Broadway)
Boulder, CO 80303

Projection:

Geographic (lat/long)

Spatial Representation:

(1) Vector polygonal classed units at a claimed scale of 1:30,000,000.
(2) 10-minute global 1080x2160 grids rasterized from the vector data.

Temporal Representation:

Static modern composite.

Data Representation:

Classes represented in an attribute values file, linked to areas by numerical code.

Layers and Attributes:

One vector layer with three attributes; with the same data represented in three dependent single-attribute raster layers.

Compressed Data Volume:

Approximately 800KB

ADDITIONAL REFERENCES

Bailey, R.G. 1991. Design of ecological networks for monitoring global change. *Environmental Conservation*, Vol. 18, No. 2, pp. 173-176.

Bailey, R.G. 1985. The factor of scale in ecosystem mapping. *Environmental Management* Vol. 9, No. 4, pp.271-276.

Bailey, R.G. 1987. Suggested hierarchy of criteria for multi-scale ecosystem mapping. *Landscape and Urban Planning*, Vol. 14, pp. 313-319.

Bailey, R.G. 1984. Testing an ecosystem regionalization. *Journal of environmental Management*, Vol. 19, ppl 239-248.

Bailey, R.G. 1983. Delineation of ecosystem regions. *Environmental Management*, Vol. 7, No. 4, pp. 365-373.

Gerasimov, I.P. (Ed.) 1964. Types of natural landscapes of the Earth's land areas. Plate 75. In Fiziko-geograficheskii Atlas Mira [Physical-geographic Atlas of the World]. USSR Academy of Sciences, Institute of Geodesy and Cartography, Moscow. Scale = 1:80,000,000.

DATA-SET FILES

```
\GLGEO\META
BEC       DOC      12026
BEC       DVC        852
BECDIV    DOC       2126
BECDOM    DOC        718
```

```
        4 file(s)      15722 bytes
\GLGEO\RASTER
BEC      IMG   2332800
BECDIV   IMG   2332800
BECDOM   IMG   2332800
        3 file(s)    6998400 bytes
\GLGEO\VALUES
BECLGND  DBF     34707
        1 file(s)      34707 bytes
\GLGEO\VECTOR
BEC      VEC    506448
        1 file(s)     506448 bytes
Total files listed:
        9 file(s)    7555277 bytes
```

REPRINT FILES

```
\DOCUMENT
BEC1_1   PCX     73299
BEC1_1X  PCX    109546
BEC1_2   PCX    137127
BEC1_3   PCX    134492
BEC1_4   PCX     67280
BEC1_5   PCX    126666
BEC1_6   PCX    121680
BEC1_7   PCX    124034
BEC1_8   PCX    128880
BEC2_1   PCX     78601
BEC2_1X  PCX     95535
BEC2_2   PCX    122009
BEC2_3   PCX     95313
BEC3_1   PCX    118538
BEC3_2   PCX    115364
BEC3_3   PCX     87852
BEC3_4   PCX    122610
BEC4_1   PCX     69951
BEC4_1X  PCX    103679
BEC4_2   PCX     95143
BEC4_3   PCX     95887
BEC4_4   PCX    103322
BEC4_5   PCX     39183
BEC7_1   PCX    108782
BEC7_2   PCX    124045
BEC7_3   PCX    100776
BEC7_4   PCX    113500
BEC7_5   PCX     73301
BEC7_6   PCX     75174
BEC7_7   PCX    101265
BEC7_8   PCX    105205
BEC7_9   PCX     37395
       32 file(s)    3205434 bytes
```

SOURCE EXAMPLE FILES

none

DATA FILE DESCRIPTION

DATA ELEMENT: Ecoregion Boundaries and Attributes

STRUCTURE: Vector polygon

SERIES:

none

SPATIAL DATA FILES

BEC.VEC

```
file title  : Bailey Ecoregions of the Continents
id type     : integer
file type   : binary
object type : polygon
ref. system : lat/long
ref. units  : deg
unit dist.  : 1.0000000
min. X      : -180.0000000
max. X      : 180.0000000
min. Y      : -90.0000000
max. Y      : 90.0000000
pos'n error : unknown
resolution  : 0.5000000
comment     :   Original was unprojected from an undocumented Russian
                projection
comment     :   by a rigorous rubber sheeting, performed at the World
comment     :   Conservation Monitoring Center (WCMC) in England.
comment     :   exported from Arc/Info at .001 degree precision at
                the National
comment     :   Geophysical Data Center in Boulder, CO.
comment     :   Re-coding of BEC (Bailey Ecoregions of the
                Continents), Division,
comment     :   and Domain as unique integer values was required for
                digital mapping.
```

ATTRIBUTE DATA FILES

BECLGND.DBF

```
Structure for database: S:\GLGEO\VALUES\BECLGND.DBF
Number of data records:      99
Date of last update   : 12/07/93
```

Field	Field Name	Type	Width	Dec	Index
1	BEC_NUM	Numeric	4		N
2	BEC_DESC	Character	165		N
3	DOM_NUM	Character	4		N
4	DOMAIN	Numeric	4		N
5	DOM_DESC	Character	24		N
6	DIV_NUM	Character	4		N
7	DIVISION	Numeric	4		N
8	DIV_DESC	Character	46		N
9	PRO_NUM	Character	4		N
10	PRO_DESC	Character	87		N

```
** Total **                    347
```

NOTES

(1) The attribute table is provided as an ascii file and as a DbaseIV file, which can be converted to Idrisi values files using the Idrisi module DBIDRIS.

DATA ELEMENT: Ecoregion Province

STRUCTURE

Raster data file: 10-minute GED 1080x2160 grid (see User's Guide)

SERIES

none

SPATIAL DATA FILES

BEC.IMG

```
file title  : Bailey Ecoregions of the World
data type   : byte
file type   : binary
columns     : 2160
rows        : 1080
ref. system : lat/long
ref. units  : deg
unit dist.  : 1.0000000
min. X      : -180.0000000
max. X      : 180.0000000
min. Y      : -90.0000000
max. Y      : 90.0000000
pos'n error : 0.5000000
resolution  : 0.5000000
min. value  : 0
max. value  : 100
value units : classes
value error : unknown
flag value  : none
flag def'n  : none
legend cats : 101
category  0 : background
category  1 :    1   POLAR DOMAIN: ICECAP DIVISION:
category  2 :    2   POLAR DOMAIN: ICECAP REGIME MOUNTAINS:
category  3 :    3   POLAR DOMAIN: SUBARCTIC DIVISION: CONTINENTAL
                     DARK EVERGREEN NEEDLELEAF OPEN FOREST
category  4 :    4   POLAR DOMAIN: SUBARCTIC DIVISION: CONTINENTAL
                     LIGHT DECIDUOUS NEEDLELEAF OPEN FOREST
category  5 :    5   POLAR DOMAIN: SUBARCTIC DIVISION: EASTERN
                     OCEANIC TAYGA
category  6 :    6   POLAR DOMAIN: SUBARCTIC DIVISION: MODERATE
                     CONTINENTAL DARK EVERGREEN NEEDLELEAF TAYGA
category  7 :    7   POLAR DOMAIN: SUBARCTIC DIVISION: CONTINENTAL
                     DARK EVERGREEN NEEDLELEAF TAYGA
category  8 :    8   POLAR DOMAIN: SUBARCTIC DIVISION: CONTINENTAL
                     AND EXTREME CONTINENTAL LIGHT DECIDUOUS TAYGA
category  9 :    9   POLAR DOMAIN: SUBARCTIC DIVISION: MODERATE
                     CONTINENTAL SMALL-LEAFED FOREST
category 10 :   10   POLAR DOMAIN: SUBARCTIC DIVISION: CONTINENTAL
                     MIXED CONIFEROUS AND SMALL-LEAFED FOREST
category 11 :   11   POLAR DOMAIN: SUBARCTIC REGIME MOUNTAINS: OPEN
                     WOODLAND-TUNDRA
category 12 :   12   POLAR DOMAIN: SUBARCTIC REGIME MOUNTAINS: OPEN
                     WOODLAND-CREEPING TREES-TUNDRA
```

```
category 13 :   13   POLAR DOMAIN: SUBARCTIC REGIME MOUNTAINS:
                     FOREST-TUNDRA OF MODERATELY AND CONTINENTAL
                     CLIMATE
category 14 :   14   POLAR DOMAIN: SUBARCTIC REGIME MOUNTAINS:
                     FOREST-CREEPING TREES-TUNDRA OF EXTREME
                     CONTINENTAL CLIMATE
category 15 :   15   POLAR DOMAIN: SUBARCTIC REGIME MOUNTAINS:
                     OCEANIC FOREST-TUNDRA
category 16 :   16   POLAR DOMAIN: TUNDRA DIVISION: POLAR DESERTS
category 17 :   17   POLAR DOMAIN: TUNDRA DIVISION: ARCTIC TUNDRAS
category 18 :   18   POLAR DOMAIN: TUNDRA DIVISION: OCEANIC
                     MOSS-AND-GRASS TUNDRA
category 19 :   19   POLAR DOMAIN: TUNDRA DIVISION: CONTINENTAL
                     MOSS-AND-LICHEN (TYPICAL) TUNDRA
category 20 :   20   POLAR DOMAIN: TUNDRA DIVISION: CONTINENTAL
                     BUSH-AND-SHRUB TUNDRA
category 21 :   21   POLAR DOMAIN: TUNDRA REGIME MOUNTAINS:
                     TUNDRA-POLAR DESERT
category 22 :   22   POLAR DOMAIN: TUNDRA REGIME MOUNTAINS: POLAR
                     DESERT
category 23 :   23   HUMID TEMPERATE DOMAIN: HOT CONTINENTAL
                     DIVISION: PERMANENTLY HUMID EASTERN OCEANIC
                     BROADLEAF FORESTS
category 24 :   24   HUMID TEMPERATE DOMAIN: HOT CONTINENTAL
                     DIVISION: MODERATELY HUMID BROADLEAF FOREST IN
                     MODERATELY CONTINENTAL CLIMATE
category 25 :   25   HUMID TEMPERATE DOMAIN: HOT CONTINENTAL REGIME
                     MOUNTAINS: FOREST-ALPINE MEADOWS
category 26 :   26   HUMID TEMPERATE DOMAIN: MARINE DIVISION: OCEANIC
                     MEADOW
category 27 :   27   HUMID TEMPERATE DOMAIN: MARINE DIVISION: WESTERN
                     OCEANIC CONIFEROUS AND MIXED FORESTS
category 28 :   28   HUMID TEMPERATE DOMAIN: MARINE DIVISION:
                     PERMANENTLY HUMID WESTERN OCEANIC BROADLEAF
                     FORESTS
category 29 :   29   HUMID TEMPERATE DOMAIN: MARINE DIVISION: WESTERN
                     OCEANIC TAYGA
category 30 :   30   HUMID TEMPERATE DOMAIN: MARINE REGIME MOUNTAINS:
                     OCEANIC MEADOW-TUNDRA
category 31 :   31   HUMID TEMPERATE DOMAIN: MARINE REGIME MOUNTAINS:
                     OCEANIC FOREST-TUNDRA
category 32 :   32   HUMID TEMPERATE DOMAIN: MARINE REGIME MOUNTAINS:
                     FOREST-ALPINE MEADOWS
category 33 :   33   HUMID TEMPERATE DOMAIN: MEDITERRANEAN DIVISION:
                     WESTERN OCEANIC MIXED SCLEROPHYLL FORESTS AND
                     SHRUB
category 34 :   34   HUMID TEMPERATE DOMAIN: MEDITERRANEAN DIVISION:
                     DRY STEPPES AND SHRUB OF MODERATE CONTINENTAL
                     CLIMATE
category 35 :   35   HUMID TEMPERATE DOMAIN: MEDITERRANEAN REGIME
                     MOUNTAINS: FOREST-ALPINE MEADOWS OF WESTERN
                     OCEANIC (MEDITERRANEAN) CLIMATE
category 36 :   36   HUMID TEMPERATE DOMAIN: MEDITERRANEAN REGIME
                     MOUNTAINS: SHRUB-FOREST-MEADOW OF MEDITERRANEAN
                     CLIMATE
category 37 :   37   HUMID TEMPERATE DOMAIN: PRAIRIE DIVISION:
                     TEMPERATE PRAIRIES (HUMID STEPPES AND WOODED
```

STEPPES) OF EASTERN PARTS OF CONTINENTS
category 38 : 38 HUMID TEMPERATE DOMAIN: PRAIRIE DIVISION: BROADLEAF-WOODED STEPPES AND MEADOW STEPPES OF MODERATELY CONTINENTAL CLIMATE
category 39 : 39 HUMID TEMPERATE DOMAIN: PRAIRIE DIVISION: SMALL-LEAFED AND CONIFEROUS WOODED STEPPES OF CONTINENTAL CLIMATE
category 40 : 40 HUMID TEMPERATE DOMAIN: PRAIRIE DIVISION: OPEN WOODLAND, SAVANNAS, AND SHRUB OF EASTERN PARTS OF CONTINENTS
category 41 : 41 HUMID TEMPERATE DOMAIN: PRAIRIE DIVISION: SUBTROPICAL PRAIRIES (HUMID STEPPES AND WOODED STEPPES) OF EASTERN PARTS OF CONTINENTS
category 42 : 42 HUMID TEMPERATE DOMAIN: PRAIRIE REGIME MOUNTAINS: CONTINENTAL STEPPE-FOREST-TUNDRA AND STEPPE-FOREST-MEADOW
category 43 : 43 HUMID TEMPERATE DOMAIN: PRAIRIE REGIME MOUNTAINS: FOREST-ALPINE MEADOWS
category 44 : 44 HUMID TEMPERATE DOMAIN: SUBTROPICAL DIVISION: OCEANIC MIXED CONSTANTLY HUMID FORESTS
category 45 : 45 HUMID TEMPERATE DOMAIN: SUBTROPICAL REGIME MOUNTAINS: FOREST-MEADOW OF EASTERN OCEANIC (MONSOON CLIMATE)
category 46 : 46 HUMID TEMPERATE DOMAIN: SUBTROPICAL REGIME MOUNTAINS: OCEANIC CONSTANTLY HUMID FOREST-ALPINE MEADOWS
category 47 : 47 HUMID TEMPERATE DOMAIN: WARM CONTINENTAL DIVISION: EASTERN OCEANIC MIXED MONSOON FOREST
category 48 : 48 HUMID TEMPERATE DOMAIN: WARM CONTINENTAL DIVISION: MODERATE CONTINENTAL MIXED FORESTS
category 49 : 49 HUMID TEMPERATE DOMAIN: WARM CONTINENTAL REGIME MOUNTAINS: OCEANIC FOREST-TUNDRA
category 50 : 50 HUMID TEMPERATE DOMAIN: WARM CONTINENTAL REGIME MOUNTAINS: OCEANIC FOREST-CREEPING TREES
category 51 : 51 HUMID TEMPERATE DOMAIN: WARM CONTINENTAL REGIME MOUNTAINS: FOREST-TUNDRA OF MODERATELY CONTINENTAL AND CONTINENTAL CLIMATE
category 52 : 52 DRY DOMAIN: TEMPERATE DESERT DIVISION: SEMI-DESERTS AND DESERTS OF CONTINENTAL CLIMATE
category 53 : 53 DRY DOMAIN: TEMPERATE DESERT DIVISION: SEMI-DESERTS OF CONTINENTAL CLIMATE
category 54 : 54 DRY DOMAIN: TEMPERATE DESERT DIVISION: DESERTS OF CONTINENTAL CLIMATE
category 55 : 55 DRY DOMAIN: TEMPERATE DESERT DIVISION: SEMI-DESERTS OF EXTREME CONTINENTAL CLIMATE
category 56 : 56 DRY DOMAIN: TEMPERATE DESERT DIVISION: DESERTS OF EXTREME CONTINENTAL CLIMATE
category 57 : 57 DRY DOMAIN: TEMPERATE DESERT REGIME MOUNTAINS: EXTREME CONTINENTAL DESERT-STEPPE
category 58 : 58 DRY DOMAIN: TEMPERATE STEPPE DIVISION: DRY STEPPES OF CONTINENTAL CLIMATE
category 59 : 59 DRY DOMAIN: TEMPERATE STEPPE DIVISION: STEPPES OF MODERATELY CONTINENTAL CLIMATE
category 60 : 60 DRY DOMAIN: TEMPERATE STEPPE DIVISION: DRY STEPPES OF EXTREME CONTINENTAL CLIMATE
category 61 : 61 DRY DOMAIN: TEMPERATE STEPPE REGIME MOUNTAINS: FOREST-ALPINE MEADOWS

category 62 :	62	DRY DOMAIN: TEMPERATE STEPPE REGIME MOUNTAINS: CONTINENTAL OPEN WOODLAND-STEPPE
category 63 :	63	DRY DOMAIN: TROPICAL/SUBTROPICAL DESERT DIVISION: SHRUB AND SEMI-SHRUB SEMI-DESERTS AND DESERTS OF CONTINENTAL CLIMATE
category 64 :	64	DRY DOMAIN: TROPICAL/SUBTROPICAL DESERT DIVISION: SEMI-DESERTS AND DESERTS
category 65 :	65	DRY DOMAIN: TROPICAL/SUBTROPICAL DESERT DIVISION: INNER CONTINENTAL SHRUB SEMI-DESERT
category 66 :	66	DRY DOMAIN: TROPICAL/SUBTROPICAL DESERT DIVISION: INNER CONTINENTAL DESERTS OF CONTINENTAL CLIMATE
category 67 :	67	DRY DOMAIN: TROPICAL/SUBTROPICAL DESERT DIVISION: WESTERN OCEANIC SEMI-DESERTS AND DESERTS WITH HIGH RELATIVE HUMIDITY
category 68 :	68	DRY DOMAIN: TROPICAL/SUBTROPICAL DESERT DIVISION: INNER CONTINENTAL SEMI-DESERTS AND DESERTS OF EXTREME CONTINENTAL CLIMATE
category 69 :	69	DRY DOMAIN: TROPICAL/SUBTROPICAL DESERT REGIME MOUNTAINS: DESERT-STEPPE AND DESERT-STEPPE-DESERT OF CONTINENTAL CLIMATE
category 70 :	70	DRY DOMAIN: TROPICAL/SUBTROPICAL DESERT REGIME MOUNTAINS: EXTREME CONTINENTAL DESERT
category 71 :	71	DRY DOMAIN: TROPICAL/SUBTROPICAL DESERT REGIME MOUNTAINS: DESERT-STEPPE
category 72 :	72	DRY DOMAIN: TROPICAL/SUBTROPICAL DESERT REGIME MOUNTAINS: DESERT
category 73 :	73	DRY DOMAIN: TROPICAL/SUBTROPICAL STEPPE DIVISION: STEPPES AND SHRUB OF MODERATE CONTINENTAL CLIMATE
category 74 :	74	DRY DOMAIN: TROPICAL/SUBTROPICAL STEPPE DIVISION: DRY STEPPES, OPEN WOODLAND, AND SHRUB OF CONTINENTAL CLIMATE
category 75 :	75	DRY DOMAIN: TROPICAL/SUBTROPICAL STEPPE DIVISION: SHRUB AND SEMI-SHRUB SEMI-DESERTS OF CONTINENTAL CLIMATE
category 76 :	76	DRY DOMAIN: TROPICAL/SUBTROPICAL STEPPE DIVISION: DESERT-LIKE SAVANNAS, OPEN WOODLAND, AND SHRUB
category 77 :	77	DRY DOMAIN: TROPICAL/SUBTROPICAL STEPPE DIVISION: DRY STEPPES AND SHRUB OF MODERATE CONTINENTAL CLIMATE
category 78 :	78	DRY DOMAIN: TROPICAL/SUBTROPICAL STEPPE REGIME MOUNTAINS: FOREST-MEADOW-STEPPE OF CONTINENTAL CLIMATE
category 79 :	79	DRY DOMAIN: TROPICAL/SUBTROPICAL STEPPE REGIME MOUNTAINS: OPEN WOODLAND-STEPPE OF CONTINENTAL CLIMATE
category 80 :	80	DRY DOMAIN: TROPICAL/SUBTROPICAL STEPPE REGIME MOUNTAINS: OPEN WOODLAND-SHRUB-DESERT
category 81 :	81	DRY DOMAIN: TROPICAL/SUBTROPICAL STEPPE REGIME MOUNTAINS: OPEN WOODLAND-STEPPE
category 82 :	82	HUMID TROPICAL DOMAIN: RAINFOREST DIVISION: EASTERN OCEANIC CONSTANTLY HUMID FORESTS
category 83 :	83	HUMID TROPICAL DOMAIN: RAINFOREST DIVISION: MIXED FORESTS WITH SHORT DRY SEASON
category 84 :	84	HUMID TROPICAL DOMAIN: RAINFOREST DIVISION:

```
                        CONSTANTLY HUMID EVERGREEN FORESTS
category 85 :   85      HUMID TROPICAL DOMAIN: RAINFOREST DIVISION:
                        HUMID FORESTS WITH SHORT DRY SEASON
category 86 :   86      HUMID TROPICAL DOMAIN: RAINFOREST REGIME
                        MOUNTAINS: FOREST-MEADOW OF CONSTANTLY HUMID
                        EASTERN OCEANIC TYPE
category 87 :   87      HUMID TROPICAL DOMAIN: RAINFOREST REGIME
                        MOUNTAINS: FOREST-PARAMO AND FOREST-MEADOW OF
                        CONSTANTLY HUMID OCEANIC (AND WINDWARD-SLOPE)
                        TYPE
category 88 :   88      HUMID TROPICAL DOMAIN: RAINFOREST REGIME
                        MOUNTAINS: FOREST-PARAMO AND FOREST-MEADOW
category 89 :   89      HUMID TROPICAL DOMAIN: SAVANNA DIVISION:
                        SEASONALLY HUMID MIXED (DECIDUOUS AND EVERGREEN)
                        FORESTS
category 90 :   90      HUMID TROPICAL DOMAIN: SAVANNA DIVISION:
                        SAVANNAS, OPEN WOODLAND AND SHRUB WITH SEASONAL
                        MOISTURE SUPPLY
category 91 :   91      HUMID TROPICAL DOMAIN: SAVANNA DIVISION:
                        SEASONALLY HUMID, PREDOMINANTLY DECIDUOUS
                        FORESTS
category 92 :   92      HUMID TROPICAL DOMAIN: SAVANNA DIVISION: HUMID
                        TALL-GRASS SAVANNAS AND SAVANNA FORESTS
category 93 :   93      HUMID TROPICAL DOMAIN: SAVANNA DIVISION:
                        MODERATELY HUMID GRASSY SAVANNAS
category 94 :   94      HUMID TROPICAL DOMAIN: SAVANNA DIVISION: DRY
                        SAVANNAS AND OPEN WOODLAND
category 95 :   95      HUMID TROPICAL DOMAIN: SAVANNA REGIME DIVISION:
                        FOREST-STEPPE AND FOREST-MEADOW OF SEASONALLY
                        HUMID TYPE
category 96 :   96      HUMID TROPICAL DOMAIN: SAVANNA REGIME DIVISION:
                        FOREST-MEADOW, SEASONALLY HUMID
category 97 :   97      HUMID TROPICAL DOMAIN: SAVANNA REGIME DIVISION:
                        FOREST-STEPPE, INNER CONTINENTAL AND LEEWARD
                        SLOPES
category 98 :           not used
category 99 :           not used
category100 :  100      LAKES
comment     :   classes are unique occurances from the original
                Arc/Info polygon attribute table (PAT)
lineage     :   Projection corrected at the World Conservation
                Monitoring Center
lineage     :   Converted from Arc/Info coverage at the National
                Geophysical Data
lineage     :   Rasterized at 10-minute grid at the National
                Geophysical Data Center
```

NOTES:

(1) Units are identical to those in the vector file

(2) Legend includes Domain and Division names

DATA ELEMENT: Ecoregion Domain

STRUCTURE:

Raster data file: 10-minute GED 1080x2160 grid (see User's Guide)

SERIES:

none

SPATIAL DATA FILES

BECDOM.IMG

```
file title  : Bailey's Ecoregions of the World - Domain
data type   : byte
file type   : binary
columns     : 2160
rows        : 1080
ref. system : lat/long
ref. units  : deg
unit dist.  : 1.0000000
min. X      : -180.0000000
max. X      : 180.0000000
min. Y      : -90.0000000
max. Y      : 90.0000000
pos'n error : unknown
resolution  : 0.5000000
min. value  : 0
max. value  : 5
value units : classes
value error : unknown
flag value  : 0
flag def'n  : no data
legend cats : 6
category  0 : 0  background
category  1 : 1  100   POLAR DOMAIN
category  2 : 2  200   HUMID TEMPERATE DOMAIN
category  3 : 3  300   DRY DOMAIN
category  4 : 4  400   HUMID TROPICAL DOMAIN
category  5 : 5  Lakes
```

NOTES:

(1) Units are reclassed from BEC.IMG

DATA ELEMENT: Ecoregion Division

STRUCTURE:
Raster data file: 10-minute GED 1080x2160 grid (see User's Guide)

SERIES:
none

SPATIAL DATA FILES:
```
BECDIV.IMG
file title  : Bailey's Ecoregions of the Continents -- Division
data type   : byte
file type   : binary
columns     : 2160
rows        : 1080
ref. system : lat/long
ref. units  : deg
unit dist.  : 1.0000000
min. X      : -180.0000000
max. X      : 180.0000000
min. Y      : -90.0000000
max. Y      : 90.0000000
pos'n error : unknown
resolution  : 0.5000000
min. value  : 0
max. value  : 31
value units : classes
value error : unknown
flag value  : 0
flag def'n  : no data [and background]
legend cats : 32
category  0 :  0  no data
category  1 :  1  110   ICECAP DIVISION
category  2 :  2  M110  SUBARCTIC DIVISION
category  3 :  3  130   SUBARCTIC DIVISION
category  4 :  4  M130  SUBARCTIC REGIME MOUNTAINS
category  5 :  5  120   TUNDRA DIVISION
category  6 :  6  M120  TUNDRA REGIME MOUNTAINS
category  7 :  7  220   HOT CONTINENTAL DIVISION
category  8 :  8  M220  HOT CONTINENTAL REGIME MOUNTAINS
category  9 :  9  240   MARINE DIVISION
category 10 : 10  M240  MARINE REGIME MOUNTAINS
category 11 : 11  260   MEDITERRANEAN DIVISION
category 12 : 12  M260  MEDITERRANEAN REGIME MOUNTAINS
category 13 : 13  250   PRAIRIE DIVISION
category 14 : 14  M250  PRAIRIE REGIME MOUNTAINS
category 15 : 15  230   SUBTROPICAL DIVISION
category 16 : 16  M230  SUBTROPICAL REGIME MOUNTAINS
category 17 : 17  210   WARM CONTINENTAL DIVISION
category 18 : 18  M210  WARM CONTINENTAL REGIME MOUNTAINS
category 19 : 19  340   TEMPERATE DESERT DIVISION
category 20 : 20  M340  TEMPERATE DESERT REGIME MOUNTAINS
category 21 : 21  330   TEMPERATE STEPPE DIVISION
category 22 : 22  M330  TEMPERATE STEPPE REGIME MOUNTAINS
```

```
category 23 : 23  320   TROPICAL/SUBTROPICAL DESERT DIVISION
category 24 : 24  M320  TROPICAL/SUBTROPICAL DESERT REGIME MOUNTAINS
category 25 : 25  310   TROPICAL/SUBTROPICAL STEPPE DIVISION
category 26 : 26  M310  TROPICAL/SUBTROPICAL STEPPE REGIME MOUNTAINS
category 27 : 27  420   RAINFOREST DIVISION
category 28 : 28  M420  RAINFOREST REGIME MOUNTAINS
category 29 : 29  410   SAVANNA DIVISION
category 30 : 30  M410  SAVANNA REGIME DIVISION
category 31 : 31  Lakes
```

NOTES

(1) Units are reclassed from BEC.IMG

TECHNICAL REPORT

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Source Data:

The source dataset was obtained through Mark Collins of the World Conservation Monitoring Center in U.K. following various unsuccessful attempts to unproject the original digital version provided to us by the National Ecology Research Laboratory (Digitized by Robert Waltermier from Robert Bailey's original map). The original map was thought to conform to an unknown Ginsberg modified Polyconic projection, but we were only able to confirm that it is based on a Russian projection used in the Gerasimov atlas (see Additional References, above). A copy of the Gerasimov atlas resides at NGDC in Boulder, and NGDC has close contacts with the cartographic institute which produced the atlas (part of the former USSR Academy of Sciences in Moscow). These contacts provided the following information about the projection used for Plate 75 of the atlas (which was apparently the base map for Bailey's work):

1. The projection is a modified polyconic projection of the USSR Geodetic and Cartographic Institute (Academy of Sciences).
2. In 1971 the projection was approximated at the institute by computer analysis using 9th order polynomials in latitude and longitude, with control points on a 5 degree grid. Otherwise, there is no known mathematical transfromation.

The polynomial approximation techniques developed in Moscow for reprojection are similar to most rubber-sheeting methods (which also use polynomial approximation). Since the WCMC version was already done, and was kindly made available for the project, we decided to use that version.

Original Documentation:

The following information is extracted from documentation of November 27, 1990 for the "ECOREGIONS OF THE CONTINENTS DATA BASE" distributed with the original version of the dataset by the National Ecology Research Center, U.S. Fish and Wildlife Service, 4512 McMurray Avenue, Ft. Collins, CO 80525-3400:

> The National Ecology Research Center digitized the Ecoregions of the Continents map (Robert G. Bailey, U.S. Department of Agriculture, Forest Service, Washington, 1989) at a scale of 1:30,000,000 from a paper source. Arc/Info Version 5.01 software was used to digitize the map in table inches using an Altek Model 34.3 tablet with a resolution of .001" (.0254mm)

and an accuracy of +/- .003" (+/- .08mm).

The center was unable to determine which [projection] was used.

Since the projection and specific parameters of the source map are unknown, it is not possible to accurately transform the ECOWRLD coverage to projected units. USERS OF THE ECOWRLD COVERAGE (in table inches) ARE ADVISED THAT THE NATIONAL ECOLOGY RESEARCH CENTER ASSUMES NO RESPONSIBILITY FOR A TRANSFORMATION OF THE EXISTING COVERAGE OR FOR RESULTS OBTAINED FROM A RUBBER SHEETING PROCESS.

Rubber sheeting can be applied if a generous number of control points are used. The accuracy of the final product, however, may still be in question depending on the number and accuracy of the links used (Andrew Duff, ESRI, personal communicatioin).

WCMC Documentation:

The data were provided to us from WCMC on floppy disk as an Arc/Info Export file in compressed format. Documentation supplied with the WCMC version provides the following information:

Information Content:

Digital data obtained from the Ecology Research Center, US Fish and Wildlife Service. The data has been digitised in table inches using an Altek Model 34-3 tablet with a resolution of 0.254mm and an accuracy of +/- .003 inches (+/-) .08mm) in ARC/INFO v.5.01. The projection of the map was unknown, although tic locations were provided. The transformation of the tic points was unsuccessful so the data [were] transformed up to World Data[bank] II and then rubber sheeted using over 7000 links. Rubber Sheeting was applied at WCMC. The (polygon) data is presented with a single polygon attribute file for each coverage.

```
Description of coverage Bailey [from ARC/INFO]:

Precision single
ARCS                              POLYGONS
Arcs       =     1574             Polygons   =     633
Segments   =     40213            Polygon Topology is present
0 bytes of Arc Attribute Data     186 bytes of Polygon Attribute
Data

NODES                             POINTS
Nodes      =     1599             Label Points    =     632
0 bytes of Node Attribute Data

TOLERANCES                        SECONDARY FEATURES
Fuzzy      =     0.006 V          Tics       =     288
Dangle     =     0.000 N          Links      =     0

COVERAGE BOUNDARY
```

```
Xmin =      -180.000              Ymin =      -90.000
Xmax =       180.000              Ymax =       90.000

COORDINATE SYSTEM DESCRIPTION
Projection      GEOGRAPHIC
  Units                   DD          Spheroid      CLARK1866
```

The following table lists the original control points from NERC and those provided in the WCMC reprojected coverage:

IDTIC	XTIC(Orig)	YTIC(Orig)	XTIC(WCMC)	YTIC(WCMC)
1	-180	60	-.1799959E+03	0.5999799E+02
2	0	80	0.0000000E+00	0.7999663E+02
3	80	80	0.7999514E+02	0.7999663E+02
4	180	60	0.1799959E+03	0.5999799E+02
5	160	20	0.1599998E+03	0.1999937E+02
6	160	-20	0.1599998E+03	-19.999370
7	180	-60	0.1799959E+03	-59.997990
8	120	-80	0.1199927E+03	-79.996630
9	-20	-80	-19.998790	-79.996630
10	-180	-60	-179.995900	-59.997990
11	-140	-20	-139.999800	-19.999370
12	-140	20	-.1399998E+03	0.1999937E+02
13	-40	20	-.3999995E+02	0.1999937E+02
14	80	20	0.7999991E+02	0.1999937E+02
15	80	-20	0.7999991E+02	-19.999370
16	-40	-20	-39.999950	-19.999370

This suggests agreement to about three decimal places, however it is uncertain if the WCMC tic coordinates are those reprojected from original table inches after determining the rubber sheeting parameters, or if they were used as part of the control point array (in which case the agreemenent could not be taken as a general result for the overall map).

Data Integration:

The WCMC version of the Bailey's Ecoregions dataset was exported from PC Arc/Info v.3.4D Plus to Idrisi 4.0 preserving coordinate precision to three decimal places and using region codes created from unique combinations of fields in the attribute table. Thus BEC.VEC is a vector data file with polygon IDs corresponding to codes that were assigned for each of the Bailey Ecoregion classes. The codes were created by numbering the unique occurances of Domain, Division, and Province in the dataset.The resulting vector polygon file was also rasterized into a 10-minute global image file (BEC.IMG) in the GED format (see User's Guide). The attributes Domain and Division were similarly coded from the Polygon Attribute Table and assigned to the Ecoregions map to produce derived raster layers. Both BECDOM and BECDIV are thus simple reclassifications of BEC. Since the Province attribute is essentially the same as the BEC classes, a separate image/map was not created for it. The descriptive legend for the numerically coded classes in BEC was created by combining the information for Domain, Division, and Province from the attribute table.

Quality Control and Testing:

Various quality checks were performed during and after the integration process. First, visual comparisons were made with Micro World Data Bank II in Arc/Info and Idrisi. Micro World Databank II is the standard georeference adopted by the GED Project, and is considered acceptable to 2 minute resolution (.033 deg.). Distance measurements were made in random areas appearing to have the greatest and/or characteristic disagreement. On this subjective basis, disagreements along the coast approaching 1-degree were found. This, however, does not appear to be an error in the re-projection process, since the MWDBII vectors are far more detailed than the Bailey polygon boundaries and no systematic or regional patterns of disagreement (i.e., consistent displacements in one direction or another over a significant region) were noticable. Projection errors would be especially evident in the polar regions in such a visual comparison, but again, the general agreement between MWDBII coasts and the BEC coasts seemed consistent. Overall registration differences between the two data sets appeared to be considerably less than the the mean difference between the coastlines, again supporting the hypothesis that discrepancies were primarily due to the resolution of the Bailey Ecoregion data, rather than projection or registration errors.

More rigorous statistical comparisons were performed to test the registration and general agreement with MWDB2 coastlines.

Accuracy of Coastline compared to Micro World Data Bank II:

Mean distance between coastlines between the Bailey dataset and MWDB2 Coasts were calculated on a 10-minute raster grid by first producing a distance map from the land/water boundary in the Bailey dataset, then extracting statistics using the MWDB2 coastline as the extraction feature. The results of this test were:

Mean coastline offset:	.22 deg.
Maximum offset:	3.5 deg.
standard deviation of offset:	.32 deg.

This indicates that about 90% of the coastal points are within .5 deg.

Registration:

Next, registration was tested by perturbing the origin in the above analysis, so that comparisons were made with a one pixel offset in four orthogonal directions. The results of this test were:

perturbation	mean coastal offset
(x+1, y+1) :	.25
(x-1, y-1):	.24
(x+1,y-1):	.25
(x-1,y+1):	.25

Mean coastal offset will increase with increasing mis-registration, and as expected increased mis-registration occurred in all four directions.This indicates that no registration error is detectable at 10-minute resolution.

Distance between points along a polygon boundary:

As a final check, statistics were produced (using a program developed by Mark Ohrenschall of NGDC) on the point spacing within the Bailey vector data. The results of this test were:

	all points weighted equally	means by polygon	s.d. by polygon
Mean point spacing:	.33	.33	.2
standard deviation:	.5	.1	---
maximum:	*8	.9	2.8

* excluding straight lines, which can have point spreads up to 58 degrees.

This indicates about 20 minute resolution at 70% confidence, 30 minute resolution at 80%, and about 50 minute resolution at 99%. Also, the polygon resolutions are evenly distributed (mean = mean of polygon means), and fairly consistent (s.d. of the polygon mean point spacing = .1); although point spacings approaching 1 deg. were common among polygons. The average (across polygons) of standard deviations of spacings within polygons was .2. The maximum s.d. of spacings within a polygon was 2.8.

Conclusion:

One must remember that grid resolution, i.e., the spacing or size of raster cells, is not the same as feature resolution. For a raster representation of this dataset that does not loose information, a 10-minute grid was necessary, although the spatial resolution of the data is no better than .5 degree and may approach 1 degree. This is because resolution of vector data varies between features, and is different for relative locations of polygon boundaries than it is for absolute locations or information internal to those boundaries.

A feature resolution of between .3 and .8 deg seems like a good estimate overall. This is supported by the mean point spacing along lines as well as the mean locational error of the coastlines. It is interesting how well this corresponds (assuming a digitizing accuracy of 1mm) to the mixed scales, 1:30,000,000 for the original Bailey map and USDA Forest Service digitized version, and 1:80,000,000 for the Russian data published in the Gerasimov atlas, which was used as a major source.

For the raster images, representation at 10-minutes was chosen to preserve boundary relationships and relative detail. A general rule of thumb in remote sensing is that ground resolution is generally limited to about 2-3 pixels. The same ratio thus exists for a 10-minute raster version of this dataset (resolvable to only .5 degree information). The difference between representation and

resolution is thus apparent and unavoidable.

The comparisons performed to test resolution and registration show that the rubber sheeting process performed by WCMC was successful and probably an order of magnitude more accurate than the data in both projection and registration. Nevertheless, this was tested only along the coastlines (unless the tic points were preserved for testing and not used as control points in the rubber sheeting process - this would have to be confirmed with WCMC). Position error of the coastline was consistent with the point spacing.